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ABSTRACT

This document reports on a study to develop an empirical method for analyzing and reporting classroom interaction data. Data were collected according to a classroom observation scheme involving the frequency of various interactions (question, answer, or management), the cognitive level of the interaction, the role of the actor, the level of personalization, and the length of the interaction in words. Tape recordings made of 24 upstate New York high school biology and chemistry classes on 6 different occasions during the 1985-1986 school year were analyzed by a panel of expert judges. Each interaction in the randomly selected 10-minute period was classified and the interactions were accumulated. Results of the analysis of these data indicated that observation variables could be grouped into scales that discriminated between teachers, and that the scales were meaningful. (TW)

BETWEEN TEACHER DISCRIMINATION AS THE BASIS FOR ANALYZING CLASSROOM INTERACTIONS

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The purpose of this study was to develop an empirical method for analyzing and reporting classroom interaction data.

Over the last two decades, educational researchers have complained about problems in obtaining reliable and generalizable summaries of classroom interaction data (McGaw, Wardrop, & Bunda. 1972). Gilmore, Kane, & Naccarato (1978) and Erlich & Borich (1979) presented methods for describing teacher behaviors based on generalizability theory (Chronbach, Gleser, Nanda, & Rajaratnam, 1972) to the operational definition of teacher behavior variables. Their efforts served to highlight the problem, but a direct application to large sample studies with many correlated observations appears to be impractical particularly when research hypotheses are multivariate or use classroom interactions as dependent variable.

One notable contribution was made by Brown, Mendanhall, & Beaver (1968) who argued that the true test of a reliability estimate was the a measure of the consistency with which teachers could be discriminated from one another. The present study drew upon their perspective by attempted to using discriminating power as the basis for combining observation variables into orthogonal

dimensions of classroom distance. Classroom differences were operationalized as the canonical discriminant functions of observation variables used to discriminate between teachers.

Methods and techniques

Data was collected according to a modification of Blosser's classroom observation scheme involving the frequency of various interactions (question, answer, or management), the cognitive level of the interaction, the role of the actor, the level of personalization, and the length of the interaction in words (Table 1). Data were summarized by counting the numbers of interaction that occurred in a standard ten-minute class segment. The nineteen variables were available for each of six class segments per teacher were used to conduct a stepwise discriminant analysis of between-teacher differences and, subsequently, to develop segment scores on the basis of the discriminant scores. The structure matrix of correlations between the discriminating variables and the discriminant function was rotated to the varimax criterion to facilitate interpretation.

Insert Table 1

Tape recordings made of 24 upstate New York high school biology and chemistry class on six different occasions during the 1985-1986 school year were analyzed by a panel of expert judges. Each interaction in the randomly selected ten minute period was classified and the interactions were accumulated.

TABLE 1:

Variables included in the between-teacher discriminant analysis of classroom discourse.

Variable	Description
Actor	
TEACH	Teacher Initiator [No = 0, Yes = 1]
STUDENT	Student Initiator [No = 0, Yes = 1]
Action	
ACT1	Question
ACT2	Student Answer
ACT3	Teacher Response to Student Answer
ACT4	Discussion Management
ACT5	Classroom Management
Question Type	
QUES1	Memory-recall
QUES2	Low Convergent
QUES3	High Convergent
QUES4	Divergent
QUES5	Evaluative
Answer type	
ANS1	Direct
ANS2	Inflected
ANS3	Student doesn't know answer
ANS4	Chorus Answer
Student named	
NAMED	Student's name used [No = 0, Yes = 1]
Length of answers	
MEANLEN	Mean Length of Student Answers
SDLEN	Standard Deviation of Answer Length

Results

A stepwise discriminant function, based on Wilks' lambda criterion, used 17 variables and provided statistically significant between-teacher discrimination (Wilks' lambda=0.0039; Chi-squared=681.80; df=368; $p<0.001$). The associated canonical correlation was 0.80 and accounted for 76.9% of the between-teacher variance. Six functions, before rotation, were statistically significant ($p<0.01$).

An examination of the rotated structure matrix (TABLE 2) of correlations between the discriminating variables and the canonical discriminant functions suggests that the first function was a measure of the frequency of low-level recitation. High scores were correlated with many questions (r=0.67), teacher talk (0.67), student answers (.66), memory/recall questions (0.63), teacher responses to student answers (0.59), direct answers (0.55), student talk (0.51), and chorus answers (0.35).

Insert Table 2

The second function differentiated teachers who had classes marked by lengthy student answers (r=0.71), answers of varied length (0.57), frequent inflected answers (0.42), and convergent questions (0.40). It was judged to be a measure of problem-solving to application discussions.

TABLE 2:

Rotated correlations between discriminating classroom discourse variables and canonical discriminant functions

(Variables ordered by size of correlation within function)

	Discriminant Function					
Variable	FUNC 1	FUNC 2	FUNC 3	FUNC 4	FUNC 5	FUNC 6
ACT1	.67*	.13	-.02	.08	-.09	-.13
TEACH	.67*	.15	.01	.05	.05	.08
ACT2	.66*	.03	.04	.02	.15	-.14
QUES1	.63*	-.06	.02	-.16	-.06	.32
ACT3	.57*	-.01	-.02	.15	.02	.02
ANS1	.55*	.11	.04	-.11	.23	.28
STUDENT	.51*	.19	-.14	-.08	-.02	.28
ANS4	.35*	.00	-.27	.12	-.27	.05
MEANLEN	.03	.71*	-.03	-.07	-.04	.13
SDLEN	.20	.57*	.04	.10	.00	-.02
ANS2	-.13	.42*	.36	.21	.13	.08
QUES3	.07	.40*	.05	-.01	.26	.02
ACT5	.09	.17*	-.17	-.12	-.11	.14
NAMED	.10	.09	.72*	-.20	.01	.10
QUES2	.11	.01	-.09	.41*	-.07	.08
QUES4	-.01	.03	-.01	.36*	.17	-.07
ANS3	.07	.06	.04	.09	.44*	-.02
ACT4	.17	.16	-.01	-.06	.06	.41*
QUES5	.07	.03	-.11	-.19	.14	-.34*

The third function was correlated with only one discriminating variable, frequent use of student names (r=0.72). It was regarded as a measure of personalization.

The fourth function was correlated with the frequency of low-convergent (r=0.41) and divergent (0.36) questions. It was regarded as movement to higher level discussion.

The fifth function was correlated with a single discourse variable, frequence that the student did not know the answer (r=0.44). It was labeled does not know and could be a reflection of the level of student knowledge or in the teacher's questioning ability.

The final function was a measure of class attempts to structure discourse and was related to the frequency of discussion management interactions (r=0.41) and low levels of evaluative questions (-0.34).

Scientific implications

This analysis indicated that classroom observation variables could be grouped into scales that discriminated between teachers and the the scales were meaningful. Since the functions accounted for a striking proportion of the between-teacher variation and were statistically significant, while retaining a high degree of interpretability, such an analysis provides a

useful approach to empirically summarizing classroom observation schemes consistent with the concept of between-teacher reliability.

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